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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,854	06/28/2006	Gilles Mathieu	0501-1162	7884

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EXAMINER	
CHANG, JEFFREY HAO-WEI	
ART UNIT	PAPER NUMBER
4177	

NOTIFICATION DATE	DELIVERY MODE
12/11/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

DocketingDept@young-thompson.com

Office Action Summary	Application No.	Applicant(s)	
	10/584,854	MATHIEU ET AL.	
	Examiner	Art Unit	
	JEFFREY H. CHANG	4177	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/25/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: The term "This application filed under 35 USC 371 of PCT/FR2004/003402 filed on December 29, 2004 which claims the foreign priority of French Application Serial No. 0315627, filed on 12/31/2003, which are hereby incorporated by reference." should be recited on Pg. 1, after the title. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1, 4, 6-8, 10-18 and 20 are rejected under 35 U.S.C. 102(a) as being anticipated by Crossman-Bosworth et al (US Pub. No. 2004/0151466 A1).

Regarding claim 1, Crossman-Bosworth et al discloses a miniature ([0006]; i.e. "micro-fabricated optical waveguide" is miniature) confocal (last sentence of [0073]) optical head for a confocal imaging system, in particular endoscopic (lines 23-26 of [0006]), the head comprising a point source (16; Fig. 1A) for producing a light beam (lines 1-6 of [0049]; where distal tip 16 of optical fiber 10 produces light), characterized in that it also comprises: a ball lens (14, 44, and 64; Figs 1A-B, 5B-D, and 7A) arranged at the end of the optical head (see Fig. 7A; where ball lens 64 is at disposed at tip of optical fiber 60), in order to cause the light beam to converge into

an excitation point (lines 25-30 of [0063]; where light beam is a "converging beam") situated in a subsurface field under observation of a sample (tissue or probe may be moved forward or backward to observe desired subsurface field), the numerical aperture of the lens and dimensions of the point source being suitable to ensure confocality of the assembly (confocality inherently determined by aperture of lens and dimensions of source), and scanning means (142; Fig. 11A-B) for displacing the point source in rotation (Fig. 11B; where point source rotated to move from position 148 to 148') so that the excitation point scans the field under observation ([0078], [0085] and [0086]; where actuator displaces optical fiber in spiral motion to scan field).

Regarding claim 4, Crossman-Bosworth et al discloses that the point source is integral with the ball lens (Fig. 5B; [0063]; where distal tip 18 of fiber 10 is fused to ball lens 44).

Regarding claim 6, Fig. 9 of Crossman-Bosworth et al discloses that the optical head comprises a fine rigid curved plate (i.e. scan lens 98) used as a window (scan lens is transparent) designed to allow the ball lens to slide over the sample (scan lens 98 separates ball lens from tissue, allowing ball lens to slide over sample).

Regarding claim 7, Figs. 5B and 11A of Crossman-Bosworth et al disclose that the scanning means act directly on the ball lens (fiber 10 is fused to ball lens 44, and actuator 142 is attached to fiber 10; therefore actuator 142 is attached to and acts directly on ball lens 44).

Regarding claim 8, Fig. 11A of Crossman-Bosworth et al discloses that the scanning means act directly on the point source (actuator 142 is attached to and acts directly on fiber 140).

Regarding claim 10, Crossman-Bosworth et al discloses that the scanning means comprise means for carrying out scanning (i.e. actuator 142) along two rotational axes of the ball

lens so as to obtain a two-dimensional image ([0078]) in real time ([0058] where vibration at 10kHz implies real time scanning).

Regarding claim 11, Crossman-Bosworth et al discloses that scanning along one of the rotational axes reaches a frequency of approximately 4 kHz ([0062]; where system runs at 4,090Hz).

Regarding claim 12, Crossman-Bosworth et al discloses that the scanning means comprise micro-motors ([0073]; where piezoelectric actuator 104 is a micro-motor).

Regarding claim 13, Crossman-Bosworth et al discloses that the scanning means comprise piezoelectric elements (i.e. piezoelectric actuator 104; [0073]).

Regarding claim 14, Crossman-Bosworth et al discloses that the scanning means comprise MEMS-type micromechanical means (lines 10-16 of [0006]).

Regarding claim 15, Fig. 11A of Crossman-Bosworth et al discloses that the optical head comprises the terminal part of an optical fibre suitable for conducting the light beam from an external source (i.e. light source 146), the light beam emerging from the fibre constituting the point source (lines 1-16 of [0049]; where distal tip 16 of optical fiber 10 is a point source).

Regarding claim 16, Crossman-Bosworth et al discloses that the optical fibre is monomode (lines 10-15 of [0049]; where "single mode" is the same as "monomode") with a core diameter and a numerical aperture (lines 16-23 of [0049]) allowing a spatial filtering of the return signal and therefore ensuring the confocality of the head (last sentence of [0073]).

Regarding claim 17, Crossman-Bosworth et al discloses that the point source is constituted by a VCSEL-type laser source (lines 6-10 of [0097]), having a numerical aperture (lines 16-23 of [0049]; where numerical aperture is required for both laser and optical fiber

sources) and a cavity outlet diameter compatible with a confocal system (inherent in VCSEL that metal top-layer contains a diameter to allow laser from active or gain region to pass; see Fig. 2 and 8b of Chang-Hasnain "Tunable VCSEL"), and associated with a detector placed behind the VCSEL cavity (inherent in VCSEL that bottom mirror placed behind VCSEL acts as a detector; see Fig. 2 and 8b of Chang-Hasnain "Tunable VCSEL").

Regarding claim 18, Crossman-Bosworth et al discloses a confocal imaging system comprising: a confocal optical head with integrated scanning (see rejection for claim 1); a source suitable for emitting a light beam (i.e. light source 146; Fig. 11A); means of detection of an emitted signal (i.e. photodiode 106; Fig. 10B); means for electronic and computer control and processing of the signal emitted suitable for reconstructing a confocal image of a field image ([0080] where scanning system acquires and displays image scanned, and acquisition of image from photodiode 106 necessarily requires signal processing to make signals suitable for display), characterized in that the optical head is according to claim 1 (see rejection for claim 1).

Regarding claim 20, Crossman-Bosworth et al discloses that the optical head comprises a VCSEL laser source and an integrated detector (see rejection for claim 17), and the system comprises flexible connection means (140; Fig. 11A) between the optical head (i.e. tip of 140) and the signal processing means (i.e. controller 146).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Crossman-Bosworth et al (US Pub. No. 2004/0151466 A1) in view of Boppart et al (US Pat. No. 6,485,413 B1).

Regarding claim 2, it is noted that Crossman-Bosworth et al does not disclose that the point source pivots independently of the ball lens as required. However, Fig. 6C of Boppart et al discloses that the point source pivots independently of the ball lens (distal tip of optical fiber 58 pivots based on arrow direction independently of fixed GRIN lens 62). Note that GRIN and ball

lenses are interchangeable in the endoscope art (see e.g. Crossman-Bosworth et al lines 5-8 of [0050] and Figs. 1A-D). Hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Crossman-Bosworth et al with the feature of the point source pivots independently of the ball lens as taught by Boppart et al, as both Crossman-Bosworth et al and Boppart et al are directed to the miniature confocal optical head for a confocal imaging system. The motivation to combine is that the fixed lens with moving point source system described in Boppart et al may be used to reduce aberrations (Boppart et al: from col. 13, line 56 to col. 14, line 9; Crossman-Bosworth et al: [0066]).

Regarding claim 3, Crossman-Bosworth et al discloses that the distance between the point source and the centre of the ball lens is kept constant (see Fig. 5B; [0063]; where distal tip 18 of fiber 10 is attached to ball lens 44, and therefore the distance between the center of the ball and point source is kept constant) so that the field under observation is curved (see Fig. 8; [0071]; where field is an arc).

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crossman-Bosworth et al (US Pub. No. 2004/0151466 A1) in view of Wilta et al (European Pub. No. 0 664 101 A1).

Regarding claim 5, it is noted that Crossman-Bosworth et al does not explicitly disclose a liquid introducing means as required. However, Wilta et al discloses that such feature of the optical head comprises means for introducing a liquid between the external surface of the ball lens and the sample so as to ease the sliding of the ball lens over the sample (col. 5, lines 20-37; where cuff 46 directs liquid over lens of borescope 12 for washing the lens) is old and well

known. Hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Crossman-Bosworth et al with the feature of the liquid introducing means as taught by Wilta et al, as both Crossman-Bosworth et al and Wilta et al are directed to the miniature confocal optical head for a confocal imaging system. The motivation to combine is that a layer of liquid between a lens and a surface aids in sliding the scanning device along the tissue surface in order to scan multiple portions of the tissue.

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crossman-Bosworth et al (US Pub. No. 2004/0151466 A1) in view of Seibel et al (US Pat. No. 6,294,775 B1).

Regarding claim 9, it is noted that Crossman-Bosworth et al does not specifically disclose a corrective optical means placed between point source and ball lens as required. However, Fig. 2 of Seibel et al discloses that the optical head also comprises corrective optical means (i.e. lens 37) integral with the point source (col. 4, lines 46-48; where lens 37 is fused bonded, or mounted to distal tip) and arranged between this point source and the ball lens (see Fig. 2; col. 4, lines 54-57; where lens 37 is placed between distal tip and second lens 39) in order to correct residual aberrations of the ball lens (col. 4, lines 44-64; col. 8, lines 35-50). Hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Crossman-Bosworth et al with the feature of the corrective optical means placed between point source and ball lens as taught by Seibel et al, as both Crossman-Bosworth et al and Seibel et al are directed to the miniature confocal optical head for a confocal imaging system. The motivation to combine is that the lens placed between the distal tip of an optical

fiber and ball lens would reduce unwanted aberrations (Seibel et al: col. 4, lines 44-64; col. 8, lines 35-50; Crossman-Bosworth et al: [0066]).

9. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crossman-Bosworth et al (US Pub. No. 2004/0151466 A1) in view of Tearney et al (US Pub. No. 2002/0122246 A1).

Regarding claim 19, it is noted that Crossman-Bosworth does not specifically disclose the optical fiber configuration as required. However, Fig. 4 of Tearney et al discloses that the system is characterized by an optical fibre (2a) (i.e. line between light source and beam splitter) connected to a laser source (i.e. light source) and coupling means (i.e. Beam Splitter) for coupling the fibre (2a) with the optical fibre (2b) (i.e. line 18 between Beam Splitter and Probe 8) for transport to and from the optical head (i.e. Probe 8) and a fibre (2c) (i.e. line between detector 26 and Beam Splitter) for transporting the emitted signal to the detection means (26). Hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Crossman-Bosworth et al with the feature of the optical fiber configuration as taught by Tearney et al, as both Crossman-Bosworth et al and Tearney et al are directed to the confocal imaging system. The motivation to combine is that the both inventions are within the same field of endeavor of miniaturizing confocal scanning systems for use in endoscopes (Tearney et al: lines 5-7 of [0013]; Crossman-Bosworth et al: lines 21-25 of [0006]). Note that reference numbers are given no patentable weight, as such, it is recommended that applicant amends the limitations for "fibre" to point out which fiber applicant is referring to, notwithstanding the reference numbers.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Seibel (US Pat. No. 6,975,898 B2) directed to an optical scanning system.

"Tunable VCSEL" by Chang-Hasnaian, IEEE Journal on Selected Topics in Quantum Electronics, Vol. 6, No. 6, November/December 2000 discloses the key optical sources of vertical surface-emitting lasers (VCSELs) in optical communications.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JEFFREY H. CHANG whose telephone number is (571)270-5336. The examiner can normally be reached on Monday - Thursday, 8:00 am - 5:00 pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joe Cheng can be reached on 571-272-4433. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. H. C./
Examiner, Art Unit 4177
12/3/09

/Joe H Cheng/
Supervisory Patent Examiner
Art Unit 4177